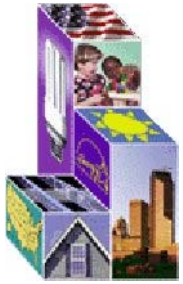
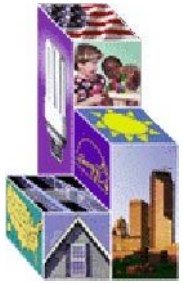


NATIONAL ENERGY SAVING AND NET PRESENT VALUE

James E. McMahon
(JEMcMahon@LBL.gov)
Ernest Orlando Lawrence Berkeley National Laboratory

U.S. DOE Workshop on Standards
for Residential Furnaces and Boilers
July 17, 2001



National Energy Saving and Net Present Value Analysis:

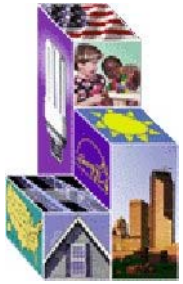
Overview

- Energy consumption for residential space heating by fuel will be calculated annually for a base case and standards cases
- The difference between base case consumption and consumption in each standards case represents energy Saving
- Results will be reported in physical units (quadrillion Btus primary energy) and economic units (dollars) for each year and cumulatively
- The period of analysis is from start date of standard to about 30 years later (ca. 2040)

National Energy Saving and Net Present Value Analysis:

Methods for Forecasting Shipments

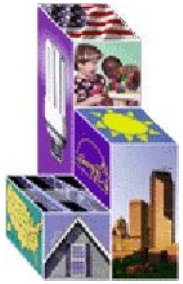
- Extrapolate from time series
  - No explicit accounting for number of households, percent owning equipment, changes in installed cost or operating expense
- Forecast using accounting model
  - new households and percent by equipment type
  - replacement as function of equipment lifetime
- Consider impacts of existing non-regulatory efforts on base case efficiencies in future years.



National Energy Saving and Net Present Value Analysis:

DOE Requests Input from Stakeholders on Shipments

- What other approaches should the Department consider to establish the forecasts for base case and standards cases?
- What are the best information sources for past shipment data by efficiency level?
- What existing non-regulatory initiatives should be considered in the base case?



National Energy Saving and Net Present Value Analysis:

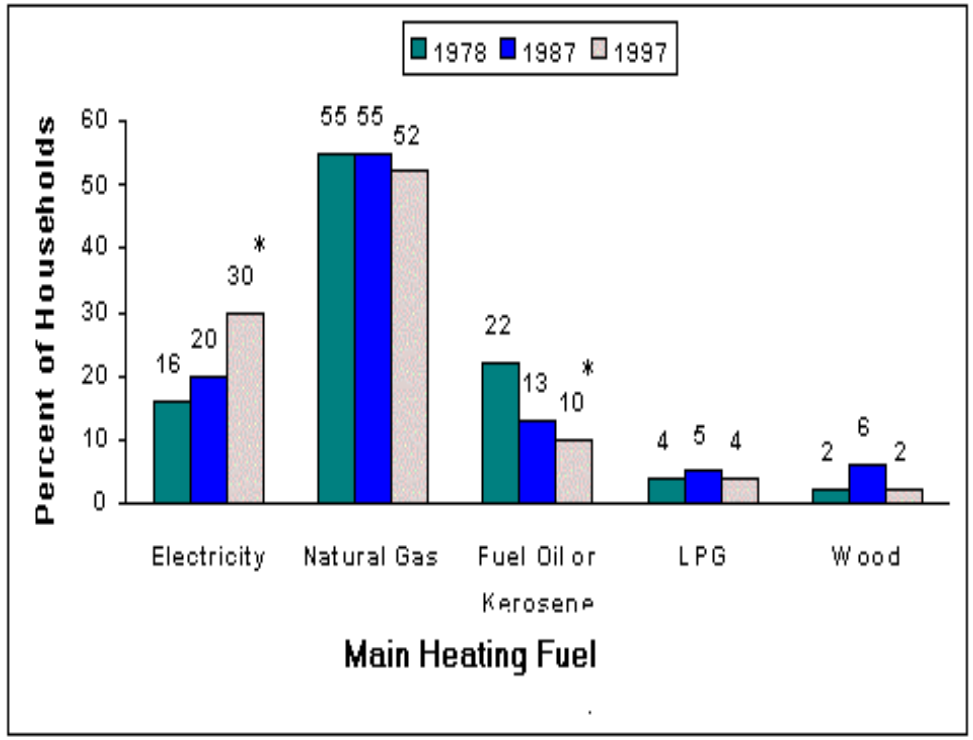
Consumer Economic Factors Affect Fuel Choice

- **Operating expenses:** typically hundreds of dollars per household per year, depending upon fuel type, energy prices, and usage.
  - $42 billion spent for household space heating (1997)
    - $27 billion for gas or LPG
    - $8 billion for electricity
    - $6 billion for oil
- **Purchase expenses:** typically thousands of dollars per installation
  - $11 billion for HVAC replacement (1994-95)
  - Plus equipment costs in new construction

National Energy Saving and Net Present Value Analysis:

Residential Main Heating Fuel,1978-97

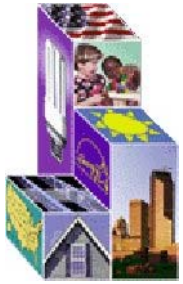
- Gas remained the most frequently used main heating fuel, 55% in 1978 and 52% in 1997.
- Electricity has increased from 16 percent in 1978 to 30 percent in 1997.
- Fuel oil or kerosene for space heat decreased from 22 percent to 10 percent.



* The difference between the 1978 and 1997 estimates is statistically significant at the 95-percent confidence level.

Source: Energy Information Administration, Residential Energy Consumption Survey, 1978, 1987, and 1997.

From http://www.eia.doe.gov/emeu/recs/



National Energy Saving and Net Present Value Analysis:

Impact of standards on fuel choice will be considered

- Historically, fuel availability, changes in relative energy costs, utility programs, other factors have caused fuel switching.
- In the period 1986-1996, American Gas Association reports between 148,000 and 311,000 housing units annually converted from another fuel to natural gas househeating.
  - This represents 3-8% of annual gas furnace shipments.

National Energy Saving and Net Present Value Analysis:

Method: Net Present Value (NPV)

- For each year analyzed, calculate the difference in installed costs and operating costs between the base case and each standards case
- Discount future values to the present
  - Include operating costs over lifetime of equipment purchased
- Sum over years to get NPV
  - If present value of savings exceeds costs, NPV is positive.
  - If present value of costs exceeds costs, NPV is negative.